



Republic of the Philippines  
**BATANGAS STATE UNIVERSITY**  
**The National Engineering University**

**Alangilan Campus**

Golden Country Homes, Alangilan, Batangas City, Philippines 4200

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**College of Engineering**

**CURRICULUM**

**Bachelor of Science in Instrumentation and Control Engineering (BSICE)**

Academic Year 2023-2024

Reference CMOs: CMO No. 4 s. 2018 and CMO No. 20 s. 2013, CMO No. 39 s. 2021,  
CMO No. 40 s. 2021

**Curriculum Description**

Instrumentation and Control Engineering provides the necessary training and technical foundation to students to become a skilled instrumentation & control specialist. An instrumentation and control engineer is essentially responsible for designing, developing, installing, managing and/or maintaining equipment and systems used to monitor and control engineering systems, machineries and processes.

**Program Educational Objectives**

The instrumentation and control engineering alumni three to five years after graduation shall;

1. Be engaged in project planning, material applications, design and installation, operations and/or maintenance in the fields of measurement, signal processing, control and industrial automation.
2. Be well-rounded individuals with strong personal skills (decision making, analytic reasoning, problem solving), professional skills (creative thinking, critical thinking, ethics and responsibilities) and able to work and communicate in team environments.
3. Participate in endeavors that promote career advancement and life-long learning.

**Institutional Graduate Attributes**

The student should achieve at least 75% for each IGA upon graduation.

1. **Knowledge Competence.** Demonstrate a mastery of the fundamental knowledge and skills required for functioning effectively as a professional in the discipline, and an ability to integrate and apply them effectively to practice in the workplace.
2. **Creativity and Innovation.** Experiment with new approaches, challenge existing knowledge boundaries and design novel solutions to solve problems.
3. **Critical and Systems Thinking.** Identify, define, and deal with complex problems pertinent to the future professional practice or daily life through logical, analytical and critical thinking.
4. **Communication.** Communicate effectively (both orally and in writing) with a wide range of audiences, across a range of professional and personal contexts, in English and Pilipino.



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5. **Lifelong Learning.** Identify own learning needs for professional or personal development; demonstrate an eagerness to take up opportunities for learning new things as well as the ability to learn effectively on their own.
6. **Leadership, teamwork, and Interpersonal Skills.** Function effectively both as a leader and as a member of a team; motivate and lead a team to work towards goal; work collaboratively with other team members; as well as connect and interact socially and effectively with diverse culture.
7. **Global Outlook.** Demonstrate an awareness and understanding of global issues and willingness to work, interact effectively and show sensitivity to cultural diversity.
8. **Social and National Responsibility.** Demonstrate an awareness of their social and national responsibility; engage in activities that contribute to the betterment of the society; and behave ethically and responsibly in social, professional and work environments.

**Student Outcomes**

The following skills, knowledge and behaviors are expected to be attained by students as they progress through the program;

1. **Discipline Knowledge.** Ability to apply knowledge of mathematics, sciences and principles of engineering to solve complex instrumentation and control engineering problems;
2. **Investigation.** Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;
3. **Design/Development of Solutions.** Design solution, system, components, processes, exhibiting improvements/innovations, that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Leadership and Teamwork.** Function effectively as a member of a leader on a diverse team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
5. **Problem Analysis.** Identify, formulate, and solve complex instrumentation and control engineering problems by applying principles of engineering, science, and mathematics;
6. **Ethics and Professionalism.** Apply ethical principles and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, environmental, and societal contexts;



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7. **Communication.** Communicate effectively on complex engineering activities with the community, and the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
8. **Environment and Sustainability.** Recognize the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development;
9. **Lifelong Learning.** Recognize the need for, and ability to engage in independent and life-long learning in the broadest context of technological change;
10. **The Engineer and Society.** Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices;
11. **Modern Tool Usage.** Apply appropriate techniques, skills, and modern engineering and IT tools to complex instrumentation and control engineering activities;
12. **Project Management and Finance.** Demonstrate knowledge and understanding of engineering management and financial principles as member or a leader of a team to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship; and
13. **Social and National Responsibility.** Apply acquired instrumentation and control engineering knowledge and skills in addressing community problems that contributes to national development.



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**CURRICULUM COMPONENTS**

Classification/ Field / Course	No. of Hours/Week		Credit Units
	Lec	Lab	
<b>I. TECHNICAL COURSES</b>			
<b>A. Mathematics</b>			
Differential Calculus	3	0	3
Integral Calculus	3	0	3
Engineering Data Analysis	3	0	3
Differential Equations	3	0	3
<b>Sub-total</b>	<b>12</b>	<b>0</b>	<b>12</b>
<b>B. Natural/Physical Sciences</b>			
General Chemistry	3	3	4
Modern Biology	2	3	3
Physics 1	3	3	4
<b>Sub-total</b>	<b>8</b>	<b>9</b>	<b>11</b>
<b>C. Basic Engineering Sciences</b>			
Introduction to Engineering	0	3	1
Engineering Drawing	0	3	1
Computer-Aided Design	0	3	1
Engineering Economics	3	0	3
Technopreneurship	3	0	3
Engineering Management	2	0	2
<b>Sub-total</b>	<b>8</b>	<b>9</b>	<b>11</b>
<b>D. Allied Courses</b>			
Analytical Instrumentation	3	0	3
Computer Programming 1	0	3	1
Digital Principles and Logic Design	3	3	4
Microprocessor and Microcontroller Systems and Design	3	3	4
Electronics Circuits: Devices and Analysis	3	3	4
Control Systems Engineering	2	3	3
Fundamentals of Data Communications	3	0	3
Industrial Networks and Protocols	3	0	3
Circuits 1	3	3	4
Circuits 2	3	3	4
Basic Occupational Safety and Health	3	0	3
Material Science and Engineering	3	0	3
Environmental Science and Engineering	3	0	3
Thermodynamics	3	0	3
Fluid Mechanics	3	0	3
PLC Fundamentals and Programming	2	3	3
Pneumatics and Hydraulic Systems	2	3	3
Physics 2	3	3	4
<b>Sub-total</b>	<b>48</b>	<b>30</b>	<b>58</b>



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<b>E. Professional Courses</b>			
<b>1. Core Courses</b>			
Advanced Engineering Mathematics for ICE	3	0	3
Fundamentals of Instrumentation	2	3	3
Principles of Process Engineering	3	0	3
Process Instrumentation	2	3	3
Sensors Engineering	2	3	3
Industrial Drives and Control	2	3	3
Control and Optimization of Unit Operations	3	0	3
ICE Seminars/Colloquium	0	3	1
Codes, Standards and Professional Ethics for ICE	3	0	3
Advanced Control System	2	3	3
ICE Capstone Design 1	0	3	1
ICE Capstone Design 2	0	3	1
Electronics Measurements and Instrumentation	1	3	2
Research Methods	3	0	3
<b>Sub-total</b>	<b>26</b>	<b>27</b>	<b>35</b>
<b>2. Technical Electives</b>			
ICE Elective 1	3	0	3
ICE Elective 2	3	0	3
<b>Sub-total</b>	<b>6</b>	<b>0</b>	<b>6</b>
<b>F. On-the Job Training</b>	320 hrs		4
<b>Total (Technical Courses)</b>	<b>108</b>	<b>75</b>	<b>137</b>
<b>II. NON-TECHNICAL COURSES</b>			
<b>A. General Education Course</b>			
Understanding the Self	3	0	3
Mathematics in the Modern World	3	0	3
The Contemporary World	3	0	3
Readings in Philippine History	3	0	3
Purposive Communication	3	0	3
Ethics	3	0	3
Art Appreciation	3	0	3
Science, Technology and Society	3	0	3
<b>Sub-total</b>	<b>24</b>	<b>0</b>	<b>24</b>
<b>B. Filipino/Literature/Mandated Courses</b>			
Kontekstwalisadong Komunikasyon sa Filipino	3	0	3
Filipino sa Iba't Ibang Disiplina	3	0	3
ASEAN Literature	3	0	3
Life and Works of Rizal	3	0	3
<b>Sub-total</b>	<b>12</b>	<b>0</b>	<b>12</b>
<b>C. Physical Activities Toward Health and Fitness</b>			
PATHFit 1 - Movement Competency Training	2	0	2
PATHFit 2 - Exercise-based Fitness Activities	2	0	2



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PATHFit 3 – Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Traditional and Recreational Games)	2	0	2
PATHFit 4 – Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Team Sports, Basketball and Volleyball)	2	0	2
<b>Sub-total</b>	<b>8</b>	<b>0</b>	<b>8</b>
<b>D. National Service Training Program</b>			
NSTP 1	3	0	3
NSTP 2	3	0	3
<b>Sub-total</b>	<b>6</b>	<b>0</b>	<b>6</b>
<b>Total (Non-Technical Courses)</b>	<b>50</b>	<b>0</b>	<b>50</b>
<b>GRAND TOTAL</b>	<b>158</b>	<b>75</b>	<b>187</b>

<b>SUMMARY</b>	
<b>Courses</b>	<b>Number of Units</b>
I. Technical Courses	
A. Mathematics	12
B. Natural/Physical Sciences	11
C. Basic Engineering Sciences	11
D. Allied Courses	58
E. Professional Courses	
1. Core Courses	35
2. Elective Courses	6
F. OJT	4
II. Non-Technical Courses	
A. General Education Courses	24
B. Filipino/Literature/Mandated Courses	12
C. PATHFit 1-4	8
D. NSTP	6
<b>TOTAL</b>	<b>187</b>



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PROGRAM OF STUDY

FIRST YEAR						
First Semester						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
MATH 401	Differential Calculus	3	0	3		
SCI 401	General Chemistry	3	3	4		
ENGG 401	Introduction to Engineering	0	3	1		
GEEd 102	Mathematics in the Modern World	3	0	3		
GEEd 105	Readings in Philippine History	3	0	3		
GEEd 101	Understanding the Self	3	0	3		
GEEd 106	Purposive Communication	3	0	3		
PATHFit 1	Movement Competency Training	2	0	2		
NSTP 111	National Service Training Program 1	3	0	3		
Total		23	6	25		

FIRST YEAR						
Second Semester						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
MATH 402	Integral Calculus	3	0	3	MATH 401	
SCI 403	Physics 1	3	3	4	MATH 401	MATH 402
GEEd 104	The Contemporary World	3	0	3		
GEEd 109	Science, Technology and Society	3	0	3		
GEEd 108	Art Appreciation	3	0	3		
ENGG 402	Engineering Drawing	0	3	1		
CpE 401	Computer Programming 1	0	3	1		
PATHFit 2	Exercise-based Fitness Activities	2	0	2	PATHFit 1	
NSTP 121	National Service Training Program 2	3	0	3	NSTP 111	
Total		20	9	23		

FIRST YEAR						
Midterm						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
GEEd 103	Life and Works of Rizal	3	0	3		
GEEd 107	Ethics	3	0	3		
SCI 402	Modern Biology	2	3	3		
Total		8	3	9		





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SECOND YEAR						
FIRST SEMESTER						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
ENGG 403	Computer-Aided Design	0	3	1	ENGG 402	
SCI 404	Physics 2	3	3	4	SCI 403	
MATH 403	Engineering Data Analysis	3	0	3	MATH 402	
MATH 404	Differential Equations	3	0	3	MATH 402	
ENGG 412	Materials Science and Engineering	3	0	3	SCI 401	
ENGG 413	Environmental Science and Engineering	3	0	3	SCI 401	
ME 431	Thermodynamics	3	0	3	SCI 403, MATH 402	
EE 424	Circuits 1	3	3	4	MATH 402	SCI 404
PATHFit 3	Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Traditional and Recreational Games)	2	0	2	PATHFit 1 and 2	
	<b>Total</b>	<b>23</b>	<b>9</b>	<b>26</b>		

SECOND YEAR						
Second Semester						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
ICE 401	Advanced Engineering Mathematics for ICE	3	0	3	MATH 404	
ICE 402	Fundamentals of Instrumentation	2	3	3		
ECE 405	Digital Principles and Logic Design	3	3	4	EE 424	ECE 421
ECE 421	Electronics Circuits: Devices and Analysis	3	3	4	EE 424	
EE 425	Circuits 2	3	3	4	EE 424	ICE 401
ME 406	Fluid Mechanics	3	0	3	ME 431	
PATHFit 4	Menu of Dance, Sports, Martial Arts, Group Exercise, Outdoor Adventure Activities Menu Offering: (Team Sports, Basketball and Volleyball)	2	0	2	PATHFit 1 and 2	
	<b>Total</b>	<b>19</b>	<b>12</b>	<b>23</b>		





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THIRD YEAR						
First Semester						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
ICE 403	Principles of Process Engineering	3	0	3	ICE 402	
ICE 404	Process Instrumentation	2	3	3	ICE 401, ICE 402	
ICE 405	Sensors Engineering	2	3	3		ECE 427
ECE 425	Control Systems Engineering	2	3	3	MATH 404, EE 425	
ECE 427	Electronics Measurements and Instrumentation	1	3	2	ECE 421, CpE 401	
ENGG 416	Research Methods	3	0	3	MATH 403	
MexE 403	Pneumatics and Hydraulics Systems	2	3	3	ME 431	
Fili 101	Kontekstwalisadong Komunikasyon sa Filipino	3	0	3		
Total		18	15	23		

THIRD YEAR						
Second Semester						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
ICE 406	Industrial Drives and Control	2	3	3	EE 425	
ENGG 404	Engineering Economics	3	0	3	MATH 402	
ECE 415	Microprocessor and Microcontroller Systems and Design	3	3	4	CpE 401, ECE 405	
ECE 426	Fundamentals of Data Communications	3	0	3		
ChE 437	Analytical Instrumentation	3	0	3	ICE 403	
MexE 407	PLC Fundamentals and Programming	2	3	3	ECE 405, MexE 403	
ICEE 401	ICE Elective 1	3	0	3	3rd year standing	
Total		19	9	22		

THIRD YEAR						
Midterm						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
ECE 429	Industrial Networks and Protocols	3	0	3	ECE 426	
ICE 407	Control and Optimization of Unit Operations	3	0	3	ChE 437	
Total		6	0	6		



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FOURTH YEAR						
First Semester						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
ICE 408	ICE Seminars/Colloquium	0	3	1	4th year standing	
ICE 409	Codes, Standards and Professional Ethics for ICE	3	0	3	4th year standing	
ICE 410	Advanced Control System	2	3	3	ICE 404, ICE 403	
ICE 411	ICE Capstone Design 1	0	3	1	ENGG 416	
ENGG 406	Engineering Management	2	0	2		
ENGG 411	Basic Occupational Safety and Health	3	0	3		
Fili 102	Filipino sa Iba't Ibang Disiplina	3	0	3		
ICEE 402	ICE Elective 2	3	0	3	ICEE 401	
Total		16	9	19		

FOURTH YEAR						
Second Semester						
Course Code	Course Title	No. of Hour/s		Unit/s	Pre-requisite/s	Co-requisite/s
		Lec	Lab			
Litr 102	ASEAN Literature	3	0	3		
ENGG 405	Technopreneurship	3	0	3	4th year standing	
ICE 412	ICE Capstone Design 2	0	3	1	Graduating	
ENGG 417	On-the-Job Training	320 hours		4	4th year standing	
Total		6	3	11		
GRAND TOTAL UNITS		158	75	187		